

CLOCK GENERATOR MODULE

BACKGROUND OF THE INVENTION

1. The field of the invention

[0001] The present invention relates to a clock generator module, and more particularly relates to a modular clock generator circuit providing various clock frequencies required. Thus, one particular electronic product is extendable for satisfying various frequencies requirements without incurring high cost on product design, and manufacturing and product management.

2. Description of the related art

[0002] The available measuring devices, data acquisition device or equipment, comprise a clock generator circuit for either analog input/output functions or digital input/output functions to achieve various functionalities. The clock in an analog input/output circuit is used for providing a sampling or updating clock to an analog-to-digital converter or a digital-to-analog converter integrated circuit. And to use the clock signal in the digital input/output circuit is for digital signal sampling or renewing

[0003] The clock circuit is designed so as to allow selection of various frequencies by a user for enjoying or achieving various appliance features, or allowing to achieving various frequencies setup. Some methods of generating clock signal are described as follows.

(a) A time base clock signal generated from an oscillator is transmitted to a frequency divider circuit of a logic circuit to achieve various frequency setup. This method of setting up various frequency results in a poor frequency resolution, but however the manufacturing cost thereof is very low. Further, the functionality of the

oscillation is limited to a certain range and is also of accuracy concern. For example, a time base clock signal frequency of **100 MHz**, when divided by **2** results into **50 MHz**; when divided by **3** results into **33.33 MHz**; when divided by **4** results into **25 MHz**; when divided by **5** results into **20 MHz**; when divided by **6** results into **16.66 MHz**, and so on, but however a frequency value between **50 MHz** and **100 MHz**, for example, a **75 MHz** cannot be achieved by the above oscillator.

(b) A **DDS** (direct digital synthesizer) **IC** is capable of providing frequency adjustment with high resolution, wherein the adjustable frequency resolution to a degree of μ **Hz**, and therefore the resulting frequency can be very exquisite. The advantage of this method is the high frequency resolution, for example, are **211.354677 KHz**, **301.3445 MHz** and other fine adjustment range. But the disadvantage is the high manufacturing cost and the highly complicated manufacturing process for producing a **DDS IC**. Additionally, the vibration levels are related to the **DDS IC**.

(c) Use **PLL** (phase lock loop) technology to generate the clock signal. The **PLL** locks up the clock signal at a certain frequency and result in an absolute accuracy, however generally speaking, the clock resolution is poorer and the clock vibration levels are related to the **PLL IC** as well.

[0004] The above three methods of generating clock signal have some advantages as well some disadvantages. If an user needs all the three types of clock generators, the user needs to purchase three measuring devices with different types of clock generators, and accordingly, the product management, the cost of design and the production would be expensive.

[0005] Therefore, a clock generator module suitable for applying in various circuit board and electronic products without incurring high cost is highly desirable.

SUMMARY OF THE INVENTION

[0006] Accordingly, in the view of the foregoing, the present inventor makes a detailed study of related art to evaluate and consider, and uses years of accumulated experience in this field, and through several experiments, to create a new and most suitable clock generator module. The present invention provides an innovated cost effective clock generator module suitable for various circuit boards and electronic products.

[0007] According to an aspect of the present invention, the clock generator module is electrically connected with a mainboard through a connector for communicating with each other, wherein the clock generator module communicates with a control logic circuit on the mainboard to generate a required clock frequency. Accordingly, based on the various appliances, a most suitable clock generator module is provided for supplying multiple clock frequency functionality. Thus, the clock generator module of the present invention satisfies every kind of appliance of clock requirements incurring less product management, low manufacture and design cost.

BRIEF DESCRIPTION OF THE DRAWING

[0008] For a more complete understanding of the present invention, reference will now be made to the following detailed description of preferred embodiments taken in conjunction with the accompanying drawings, in which:

[0009] FIG. 1 is a block diagram illustrating the link between the clock generator module and mainboard according a preferred embodiment of the present invention;

[0010] FIG. 2 is a block diagram illustrating the main logic interface definition of the clock generator module of the present invention;

[0011] FIG. 3 is a flowchart showing the application of the clock generator module of the present invention in the analog-to-digital conversion equipment; and

5 [0012] FIG. 4 is the flowchart showing the application of the clock generator module of the present invention in a measuring equipment.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0013] Reference will be made in detail to the preferred embodiments of the invention, examples of which are illustrated in the accompanying drawings. Wherever
10 possible, the same reference numbers are used in the drawings and the description to refer to the same or like parts.

[0017] Referring to FIG. 1, is a block diagram illustrating a linking between the clock generator module and mainboard according to one preferred embodiment of the present invention. As shown in FIG. 1, the clock generator module 10 and the mainboard
15 20 having an analog or a digital input/output related circuit are electrically connected through a board-to-board connector or a connection wire for communicating with each other through mutual signal transmission. Thus, each related circuit of the mainboard 20 can get the clock frequency in various specifications.

[0018] Referring to FIGs. 1 and 2, respectively illustrate the link between the clock
20 generator module 10 and mainboard 20, and a block diagram of the interface definition of the clock generator module of the present invention. The control logic circuit 26 of the mainboard 20 and the clock generator module 10 mutually transmit signals to each other, regardless of the method with which the clock is generated, the control logic circuit 26 of

the mainboard **20** is able to identify the method of generating clock, then decides to use various signal control protocol to setup the various frequency for the clock generator module **10**. The user can use software to command the clock generator module **10** through the control logic circuit **26** for setting up the frequency. The control logic circuit
5 **26** can monitor the status of the clock generator module **10** over the interface between them. In order to identify the type of module, the interface of the clock generator module **10** has to be defined. The interface definition of the clock generator module **10** comprises identification signals, interface control signals, a reference clock input signal, a clock output signal and a power supply.

10 **[0019]** Nevertheless, the above identification signals can be designed to function in a three-bit identification mode. This three-bit identification mode enables to identify eight types of clock generator modules, wherein different clock generator module will differentiate the functions based on the digital level of the three-bit identification mode. Additionally, the interface control signals use ten signals, and taking **DDS IC** as an
15 example, comprising at least an enabling signal, a serial clock signal, a serial data input signal, a reset signal, a renew signal and an error report signal.

[0020] Furthermore, the control logic circuit **26** generates the interface control signals to set various clock generator module according to retrieved three-digit identification information. And the reference clock input signal can be used when the
20 clock generator module needs a clock reference input from the mainboard, for ex, the PLL reference clock. The clock module output signal is the required clock signal outputs to the mainboard **20**. The power supply for the clock generator module **10** is supplied by the mainboard **20** to maintain the operation.

[0021] Referring to FIG. 3, the flowchart illustrating the application of the clock generator module of the present invention in the analog-to-digital conversion equipment. The control logic circuit **26** is capable of setting up the required clock output frequency of the clock generator module according to different signal control protocol for various clock generator module **10**. The analog-to-digital conversion equipment has two analog input circuits **21** to convert the analog signal into digital signal through the analog-to-digital conversion circuit **23**, and the required sampling clock for the analog-to-digital conversion circuit is generated by the clock generator module **10**. The reference clock input of the clock generator module **10** can be selected to be from the external clock input contact **22**, on-board reference clock source **27**, or the reference clock generated by the clock generator module **10** itself. The digital data generated after the conversion will be stored into the SDRAM **24** by the main logic circuit **28**. When the analog-to-digital conversion is accomplished, the main logic circuit **28** takes control of transmitting the data back to the computer through the PCI bus controller **25**.

[0022] Referring to FIG. 4, show a flowchart illustrating the application of the clock generator module of the present invention in a measuring equipment. When processing measuring, data acquisition or transmission, the control logic circuit **35** of the main logic circuit **39** accepts the command transmitted by the peripheral interface control circuit **36** to setup the required frequency for the clock generator module **10** to provide to four major functional circuits, including the analog input function, analog output function, digital input function and digital output function. For the analog input function, the clock enables the analog-to-digital conversion circuit **33** to convert the analog signal into the digital signal and transmit it to the main logic circuit **39** for further processing or

transmitting out through the peripheral interface control circuit 36. Similar to the analog input, the digital input circuit 38 is based on the clock from the clock generator module 10 to output the received digital signal to the main logic circuit 39. Vice versa, the analog output and digital output functions are also based on the clock from the clock generator module 10 to output the signal by the digital output circuit 37 or digital-to-analog conversion circuit 34.

[0023] While the invention has been described in conjunction with a specific best mode, it is to be understood that many alternatives, modifications, and variations will be apparent to those skilled in the art in light of the foregoing description. Accordingly, it is intended to embrace all such alternatives, modifications, and variations in which fall within the spirit and scope of the included claims. All matters set forth herein or shown in the accompanying drawings are to be interpreted in an illustrative and non-limiting sense.